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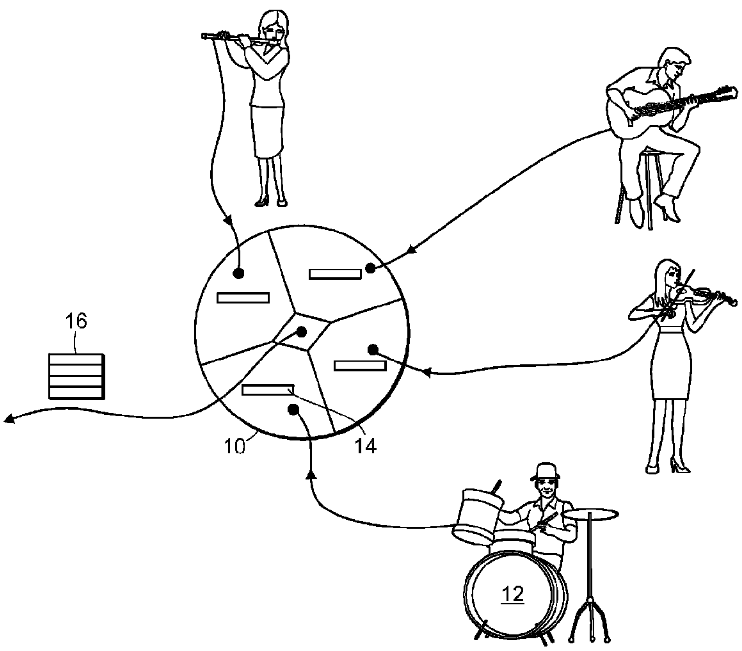
(54) Title: TRACK TRAPPING AND TRANSFER



(57) Abrégé/Abstract:
An apparatus includes an input for receiving session tracks, an audio converter for converting the first and second data into one of a plurality of audio formats, thereby generating converted session tracks; a storage medium for storing the converted session tracks; a session-track vectorization unit for packaging the converted session tracks into a session vector for transmission to the distributed music collaboration system, and a session-track transfer unit for effecting transfer of the session vector to the distributed music collaboration system.

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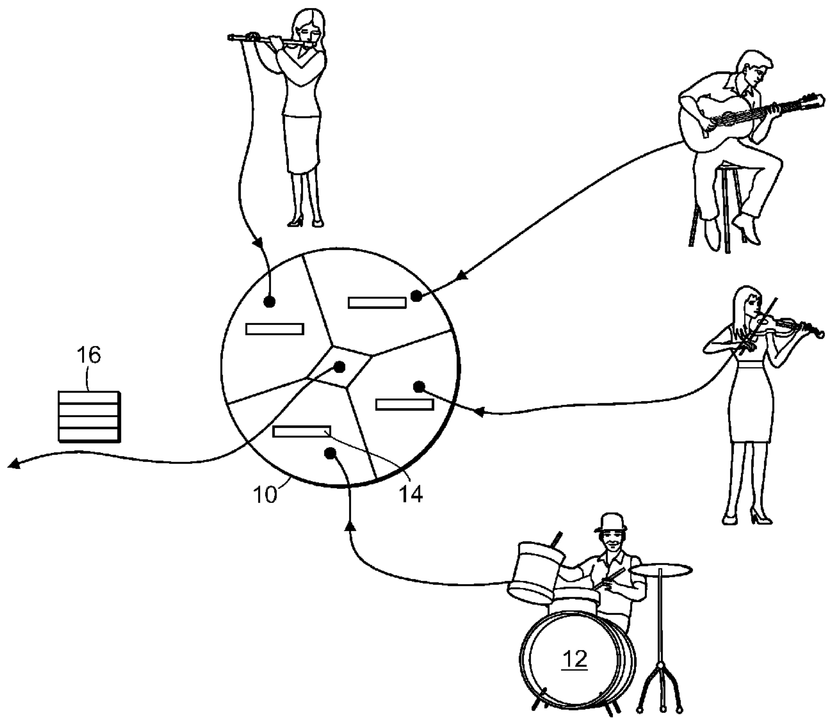
[Continued on next page]

(54) **Title**: TRACK TRAPPING AND TRANSFER



(57) **Abstract**: An apparatus includes an input for receiving session tracks, an audio converter for converting the first and second data into one of a plurality of audio formats, thereby generating converted session tracks; a storage medium for storing the converted session tracks; a session-track vectorization unit for packaging the converted session tracks into a session vector for transmission to the distributed music collaboration system, and a session-track transfer unit for effecting transfer of the session vector to the distrib - uted music collaboration system.

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TRACK TRAPPING AND TRANSFER

FIELD OF DISCLOSURE

This disclosure relates to capturing analog audio from musical instruments and microphones for storage and re-distribution.

BACKGROUND

Data representative of music has long been editable on a computer. Music editors for this function are capable of starting with raw files and processing them to create various mixes. A difficulty that arises however is that of capturing performed music on a track-by-track basis for further processing.

In general, effective editing of audio requires discrete tracks, with one track for each music source. For example, a performance by a four piece band with three singers would preferably be saved in seven discrete tracks, one for each music source. This track-by-track storage facilitates mixing by a sound editor.

Known audio-capture devices for track-based capture are typically integrated with a complete mixing console that is operated by a sound engineer at the site of the performance. A complete mixing console is an expensive, large, and unwieldy apparatus that requires considerable training to operate correctly.

SUMMARY

The invention features a stand-alone portable apparatus that allows audio to be captured in discrete tracks for later editing.

In one aspect, the invention features an apparatus for providing a distributed music collaboration system with a session vector including session tracks associated with a session, each of the session tracks containing data representative of music created by a music source during the session. Such an apparatus includes an input for receiving the session tracks, an audio converter for converting the first and second data into one of a

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plurality of audio formats, thereby generating converted session tracks, a storage medium for storing the converted session tracks, a session-track vectorization unit for packaging the converted session tracks into a session vector for transmission to the distributed music collaboration system, and a session-vector transfer unit for effecting transfer of the session vector to the distributed music collaboration system.

In one embodiment, the session-vector transfer unit is configured to modulate an electromagnetic wave to carry information representative of the session vector. Among these embodiments are those in which the session-vector transfer unit includes a transmission line interface and is further configured to launch the modulated electromagnetic wave onto the transmission line for transmission to the distributed music collaboration system. In another embodiment, the session-vector transfer unit includes a free-space electrical interface and is configured to generate current on the free-space electrical interface to launch the modulated electromagnetic wave for transmission to the distributed music collaboration system.

In additional embodiments, the input is configured to connect to a session hub for receiving data from music sources and to retrieve session tracks from the session hub.

Among the embodiments are those in which the input includes a plurality of jacks, each of which receives one session track from one music source.

Yet other embodiments include those having an input level indicator to indicate whether audio input is within an optimal dynamic range, and those having a status indicator to indicate presence or absence of a connection to the distributed music collaboration system.

The invention also includes an apparatus having any combination of some of all the foregoing features.

These and other features of the invention will be apparent from the following detailed description and the accompanying figures, in which:

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 shows a session hub with its output session vector;

FIG. 2 shows a collaboration system to which the session hub of FIG. 1 is connected;

FIG. 3 shows a time-line view of a user-interface for the collaboration system of FIG. 2;

FIG. 4 shows an annotation view of a user-interface for the collaboration system of FIG. 2;

FIG. 5 shows a mixing view of a user-interface for the collaboration system of FIG. 2;

FIG. 6 shows an editing view of a user-interface for the collaboration system of FIG. 2;

FIG. 7 shows a music view of a user-interface for the collaboration system of FIG. 2; and

FIG. 8 shows a trapper for providing session vectors to the collaboration system of FIG. 2.

DETAILED DESCRIPTION

Groups of musicians often come together to rehearse at a "session." A session hub **10**, shown in FIG. 1 and described in U.S. Patent Publ. 2009/0282967 accepts input from a musician **12** and generates one or more tracks **14** corresponding to what that musician played during a session. Each of these tracks **14** is referred to herein as a "session track." In a typical session, there will be multiple session tracks **14**.

The set of session tracks **14** concurrently obtained during a particular session defines a "session vector **16**." The number of elements in the session vector **16** is greater than or equal to the number of musicians. Each session vector **16** contains data representative of music played by one or more of the musicians.

Referring now to FIG. 2, a distributed music collaboration system **18** features a server **20** remotely connected to the session hub **10** via a wide area network **22**. The server **20** receives session vectors **16** from the session hub **10** and creates session data **24** that includes, in addition to the session vectors **16**, session metadata **26**. The session metadata **26** includes server-generated metadata **28** and user-generated metadata **30**.

To provide more convenient communication with the music collaboration system **18**, one embodiment of a session hub **10** connects to a track trapper **90** shown in FIG. 8 that captures multiple session tracks of analog audio and converts them into a selected digital audio format.

The illustrated track trapper **90** includes a multi-track input interface **92** having a variety of input receptacles for receiving analog session tracks. Examples of input receptacles include those that accommodate DB 25 jacks, TS and TRS jacks, both in eighth inch and quarter inch diameters, XLR jacks, USB jacks and mini-jacks, Thunderbolt jacks, and DisplayPort jacks. Embodiments of an input interface **92** include 2^n-track interfaces for n=1 to 4. Other embodiments include 2^n-track interfaces for n=5 to 6. In fact, there is no particular upper limit on the number of inputs.

The input interface **92** provides analog audio to an audio converter **94** having access to a program memory **96** that includes software for converting the analog audio into any one of a plurality of digital audio formats selected by the user. After converting the audio into a suitable digital format, the audio converter **94** causes it to be stored in a storage medium **98** as separate converted session tracks **14**. The storage medium **98** can be a permanent on-board storage medium or a removable storage medium, such as an SD card, a removable hard-drive, a removable solid-state memory, or any combination of the foregoing.

A session track vectorization unit **100** retrieves the converted session tracks **14,** combines them into a session vector **16**, and provides the session vector **16** to a session vector transfer unit **102** for transmission to the music collaboration system **18,** typically by modulating an electromagnetic wave to carry information representative of the session vector **16.**

The session vector transfer unit **102** includes a network interface for providing communication with a wide-area network, via either a transmission line interface, such as an Ethernet cable, or a free-space electrical interface, such as a WiFi interface for launching the modulated electromagnetic wave for transmission to the distributed music collaboration system.

A status indicator **104** includes an interface, such as LEDs or a screen, that indicates the operating status of the trapper **90** such as whether it is connected to a network, whether it is transmitting data, whether its memory is close to full, the extent of remaining charge in a battery, for those embodiments that have a battery as a power source, whether the input dynamic range is within acceptable limits, and any combination of the foregoing.

When connected to the session hub **10**, the input interface **92** of the track-trapper **90** connects to buses within the session hub **10,** each of which carries a track associated with a particular music source **12**. In other embodiments, the input interface includes inputs that can be connected directly to individual music sources **12** without the need for a separate session hub **10**. Examples of music sources **12** to which the input interface **92** connects are the output of a mixing board, or instrument cables and/or microphones associated with individual musicians. Using this feature in conjunction with a WiFi network, the track-trapper **90** can capture a live performance and stream it in essentially real-time to the distributed music collaboration system **18**. A sound editor can then quickly carry out suitable editing and mixing steps and create an audio file of the performance for wireless distribution and/or sale shortly after the end of the performance at the site of the performance itself.

Server-generated metadata **28** includes the date and time of the session, and if available, the identities of the musicians participating in the session. User-generated metadata **30** is provided by one or more users **32** accessing the collaboration system **18** using one of a corresponding plurality of clients **34**. Such a user **32** generally maintains an account with the collaboration system **18**. Through such an account, the user **32** can access session data **24** and create, alter, inspect or otherwise manipulate user-generated metadata **30**.

One way for a user **32** to create user-generated metadata **30** is to perform custom editing or mixing of the session vectors **16**. For example, a user **32** may want to alter relative volumes of session tracks **14**, either in their entirety or within selected sections. Or the user **32** may want to alter the underlying time base either entirely or in sections, thus manipulating the tempo of the music. Or a user **32** may wish to cut and paste selected portions of session tracks **14**.

Rather than alter the underlying session vector **16**, the user's various editing and mixing commands are saved as a session transform **38**. A filtering streamer **40** accepts a session transform **38** and a session vector **16** as inputs and outputs audio that can be listened to at a user's client **34.**

A user **32** who wishes to hear the music as it was recorded during the session causes the filtering streamer **40** to accept that session vector **16** as a first input, and uses an identity session transform **38** as a second input. This results in the original music being streamed to the client **34**. On the other hand, a user **32** who wishes to hear the result of his own editing and mixing or that carried out by another, specifies the session vector **16** as a first input and a particular session transform **38** as the second input. This causes the filtering streamer **40** to stream, to the client **34**, the music from that session as modified by the selected session transform **38**.

A user **32** can create several different session transforms **38** corresponding to different mixes. In doing so, the session vector **16** serves as a common foundation for all the different mixes. In addition, a user **32** can authorize other users to listen to the session vector **16** as modified by any session transform **38** by, for example, sending a link either to the session transform **38** or to a filtering streamer **40** having the appropriate session vector **16** and session transform **38** as inputs.

In addition to session transforms **38**, session metadata **26** can also include annotations **42** linked to specified time points or time intervals in one or more session tracks **14** of a session vector **16**. A user **32** on one client **34** can thus make comments pertaining to a particular session track **14** or portion thereof. These comments are saved as user-generated metadata **30** available to a user's collaborator. The collaborator may then add his own comments either in response to the user's comments or pertaining to another session track **14** or portion thereof.

The collaboration system **18** described herein thus permits a musician to collaborate with other musicians in connection with a session and to do so without creating multiple edited copies of the session data **24**.

A representative user-interface encountered by a user **32** who accesses a server hosting the collaborative music system **18** is shown in FIG. 3. The user-interface includes a view button **40** that allows the user **32** to switch between different views. These views include a time-line view **42**, shown in FIG. 3, an annotation view **44**, shown in FIG. 4, a mixing view **46**, shown in FIG. 5, an editing view **48**, shown in FIG. 6, and a human-readable music view **50**, shown in FIG. 7.

The time-line view **42**, shown in FIG. 3, features a scrollable time-line **52** having nodes **54A-54B** corresponding to each session that the user **32** is authorized to access. These nodes **54A, 54B** are ordered by the time at which the session occurred. Each node **54A-54B** is associated with a metadata field **56A**, **56B** showing the metadata **24** associated with that session. A metadata field **56A** in some embodiments appears when a user **32** clicks on or hovers over its corresponding node **54A**. The user's identity is identified in a user-ID field **58** at the top of the time-line view **42**. A top row **60** of the time-line view **42**, as well as the other views, features three buttons that reveal corresponding metadata for a currently selected session. These buttons include a first button **64** for accessing a list of musicians associated with the session, a second button **62** for accessing user-generated metadata, and a third button **66** for accessing server-generated metadata.

Clicking the first button **64** causes display of a window that shows musicians associated with the session and invites the user **32** to modify the information. Information concerning musicians can be tied to an account associated with the musician. However, this need not be the case.

Clicking the second button **62** causes display of a window that shows tags associated with the selected session and invites the user **32** to edit or add searchable information about the session. For example, the user **32** may enter information identifying the genre, or the key, or the names and/or composers of songs rehearsed during the session.

Clicking the third button **66** causes display of a window that shows date and time stamps, file size, and similar server-generated data that is also user searchable.

The annotation view **44**, shown in FIG. 4, provides features to facilitate collaboration with other users. In the annotation view **44**, a portion of the window shows session tracks **14**, or combinations thereof, in graphical form. The user **32** can introduce marker points **68** to mark selected points in one or more session tracks **14**. In the illustrated interface, these marker points **68** are triangles having a vertex resting on the graphical representation of the session track **14**. The location of the marker point **68** indicates the time relative to some fixed point in the session track **14**, which is usually the beginning of the session track **14**.

Associated with each marker point **68** is an annotation window **70** in which the user **32** can enter his observations about the session track **14**, both for himself and to share with other users. Upon clicking on a marker point **68**, the annotation window **70** opens and reveals any comments either by the user or by his collaborators. In some embodiments, the annotation window **70** has different colors corresponding to different collaborating users.

A useful feature in certain embodiments is a play-loop that enables a relevant portion of the session track **14** to be played so that a comment concerning that portion can be readily understood in its musical context.

The mixing view **46**, shown in FIG. 5, provides a way to see, for each of several sessions **72A-72E** the various session transforms **74A-74C** that have been saved by the user **32** or by his collaborators. In the particular example shown, three session transforms **74A-74C** have been saved for the first session **72A**. When the user **32** selects a session transform **74A**, the server **20** passes the session tracks **14** and the selected session transform **74A** to the filtering streamer **40** to be streamed to the user **32**.

The editing view **48**, shown in FIG. 6, provides an interface to enable users to cut, copy, and paste selections **76** within and between session tracks **14**, play, pause, fast forward, rewind, or otherwise position a play head **78**, and change levels within a specified interval **80**, either overall or for selected frequencies.

The music view **50**, shown in FIG. 7, includes a scrollable-time-line **82** similar to that shown in the time-line view **42** in which each node **84** corresponds to a session track 14. In this view, clicking on a node **84** causes display of a window **86** showing a title, lyrics, notes, or chords associated with the session track **14**.

The principles described herein, and the advantages thereof, are also applicable to the case in which no network is contemplated. For example, when implemented on a stand-alone system, a user can experiment with different mixes on the fly in the same manner described above by applying user-generated metadata to existing session data.

Having described the invention and a preferred embodiment thereof, what I claim as new and secured by letters patent is:

CLAIMS

1. An apparatus for providing a distributed music collaboration system with a session vector comprising session tracks associated with a session, each of said session tracks containing data representative of music created by a music source during said session, said apparatus comprising an input for receiving said session tracks, an audio converter for converting first and second data into one of a plurality of audio formats, thereby generating converted session tracks, a storage medium for storing said converted session tracks, a session-track vectorization unit for packaging said converted session tracks into a session vector for transmission to said distributed music collaboration system, and a session-vector transfer unit for effecting transfer of said session vector to said distributed music collaboration system.

2. The apparatus of claim **1**, wherein said session-vector transfer unit is configured to modulate an electromagnetic wave to carry information representative of said session vector.

3. The apparatus of claim **2**, wherein said session-vector transfer unit comprises a transmission line interface, said session-vector transfer unit being further configured to launch said modulated electromagnetic wave onto said transmission line for transmission to said distributed music collaboration system.

4. The apparatus of claim **2**, wherein said session-vector transfer unit comprises a free-space electrical interface, said session-vector transfer unit being further configured to generate current on said free-space electrical interface to launch said modulated electromagnetic wave for transmission to said distributed music collaboration system.

5. The apparatus of claim **1**, wherein said input is configured to connect to a session hub for receiving data from music sources, and to retrieve session tracks from said session hub.

6. The apparatus of claim **1**, wherein said input comprises a plurality of jacks, each of which receives one session track from one music source.

7. The apparatus of claim **1**, further comprising in input level indicator to indicate whether audio input is within an optimal dynamic range.

8. The apparatus of claim **1**, further comprising a status indicator to indicate presence or absence of a connection to said distributed music collaboration system.

9. The apparatus of claim **1**, wherein said input is an analog input for receiving analog session tracks.

10. The apparatus of claim **1**, wherein said audio converter is configured to receive analog audio and to convert said analog audio into digital format.

11. The apparatus of claim **1**, further comprising a battery readout for indicating power available for powering said track trapper.

12. An apparatus for communicating with a distributed music collaboration system, said apparatus comprising a track trapper configured for providing said distributed music collaboration system with a session vector comprising session tracks associated with a session, each of said session tracks containing data representative of music created by a music source during said session, said track trapper including an input for receiving said session tracks, an audio converter for converting first and second data from corresponding first and second session tracks into one of a plurality of audio formats, thereby generating converted session tracks, a storage medium for storing said converted session tracks, a session-track vectorization unit for packaging said converted session tracks into a session vector for transmission to said distributed music collaboration system, and a session-vector transfer unit for effecting transfer of said session vector to said distributed music collaboration system.

13. A track trapper device for capturing multiple session tracks of analog audio and converts them into a selected digital audio format, said track trapper device comprising a multi-track input interface, an audio converter, a program memory, a storage medium, a session-track vectorization unit, and a session-vector transfer unit, wherein said multi-track interface comprises input receptacles for receiving said analog session tracks, wherein said program memory includes software for converting said analog audio into a digital audio format that is selected by a user from among a plurality of digital audio formats, wherein said audio converter causes said audio to be stored in said storage medium as separate converted session tracks, wherein said session-track vectorization unit retrieves said converted session tracks, combines said converted session tracks into a session vector, and provides said session vector to said session vector transfer unit, and wherein said session-vector transfer units transmits said session vector to a music collaboration system.

14. The track trapper device of claim **13**, wherein said storage medium is a permanent on-board storage medium.

15. The track trapper device of claim **13**, wherein said storage medium is a removable storage medium.

16. The track trapper device of claim **13**, wherein said storage medium comprises an SD card.

17. The track trapper device of claim **13**, wherein said storage medium comprises a removable hard-drive.

18. The track trapper device of claim **13**, wherein said storage medium comprises a removable solid-state memory.

19. The track-trapper device of claim **13**, wherein said storage medium comprises a combination of a permanent on-board storage medium and a removable storage-medium.

20. The track trapper device of claim **13**, wherein said input receptacles include a DB-25 jack.

21. The track trapper device of claim **13**, wherein said input receptacles include a TS jack.

22. The track trapper device of claim **13**, wherein said input receptacles include a TRS jack.

23. The track trapper device of claim **13**, wherein said input receptacles include a mini-jack jacks.

24. The track trapper device of claim **13**, wherein said input receptacles include a Thunderbolt jack.

25. The track trapper device of claim **13**, wherein said input receptacles include a display port jack.

26. The track trapper device of claim **13**, wherein said input receptacles includes 2n-track interfaces for n=1 to 4

27. The track trapper device of claim **13**, wherein said input receptacles includes 2n-track interfaces for n=5 to 6.

28. The track trapper device of claim **13**, further comprising a status indicator to indicate that said storage medium is close to full.

29. The track trapper device of claim **13**, further comprising a status indicator to indicate that said storage medium is close to full.

30. The track trapper device of claim **13**, further comprising a status indicator to indicate remaining charge in a battery that powers said track trapper device.

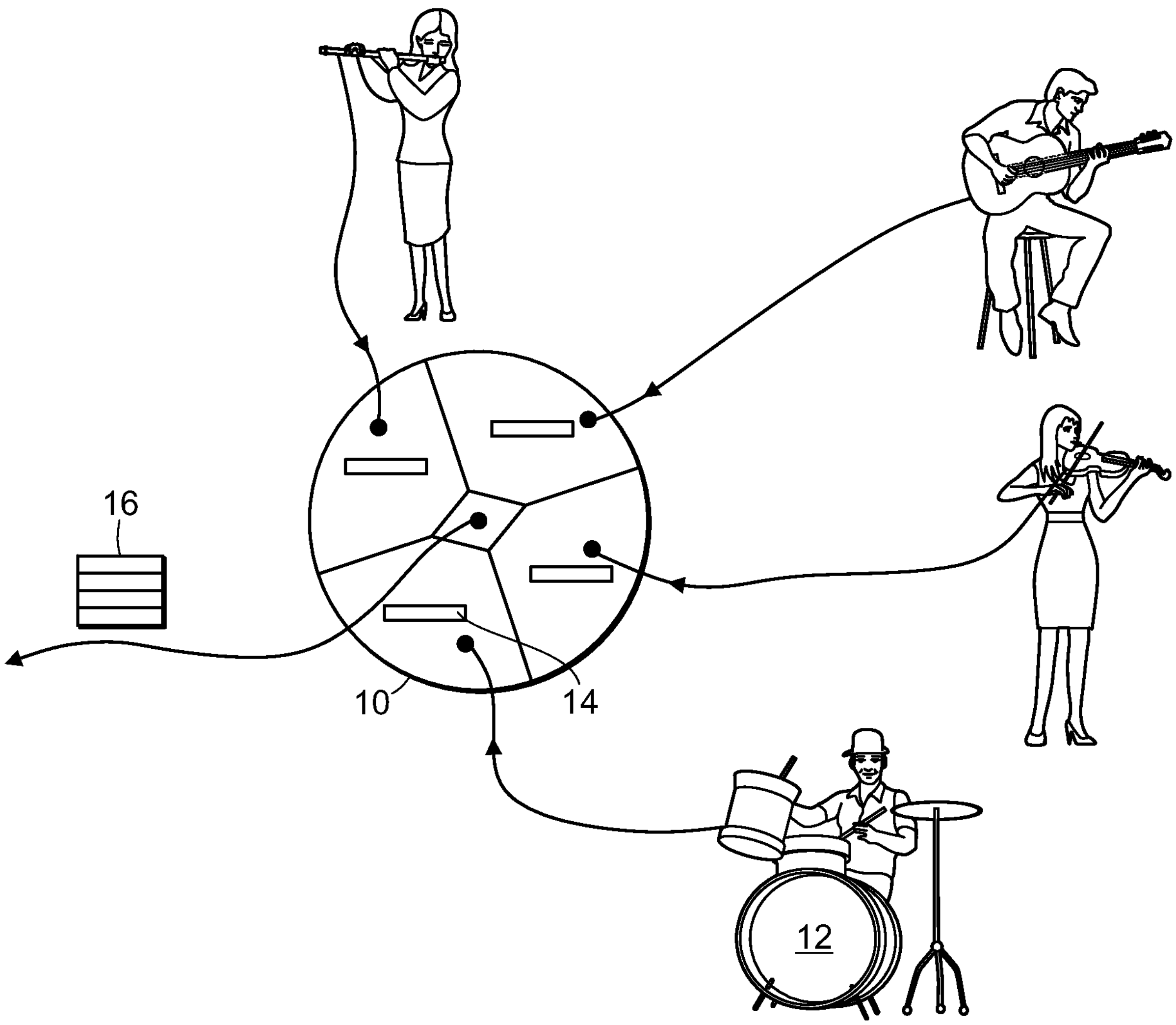


FIG. 1

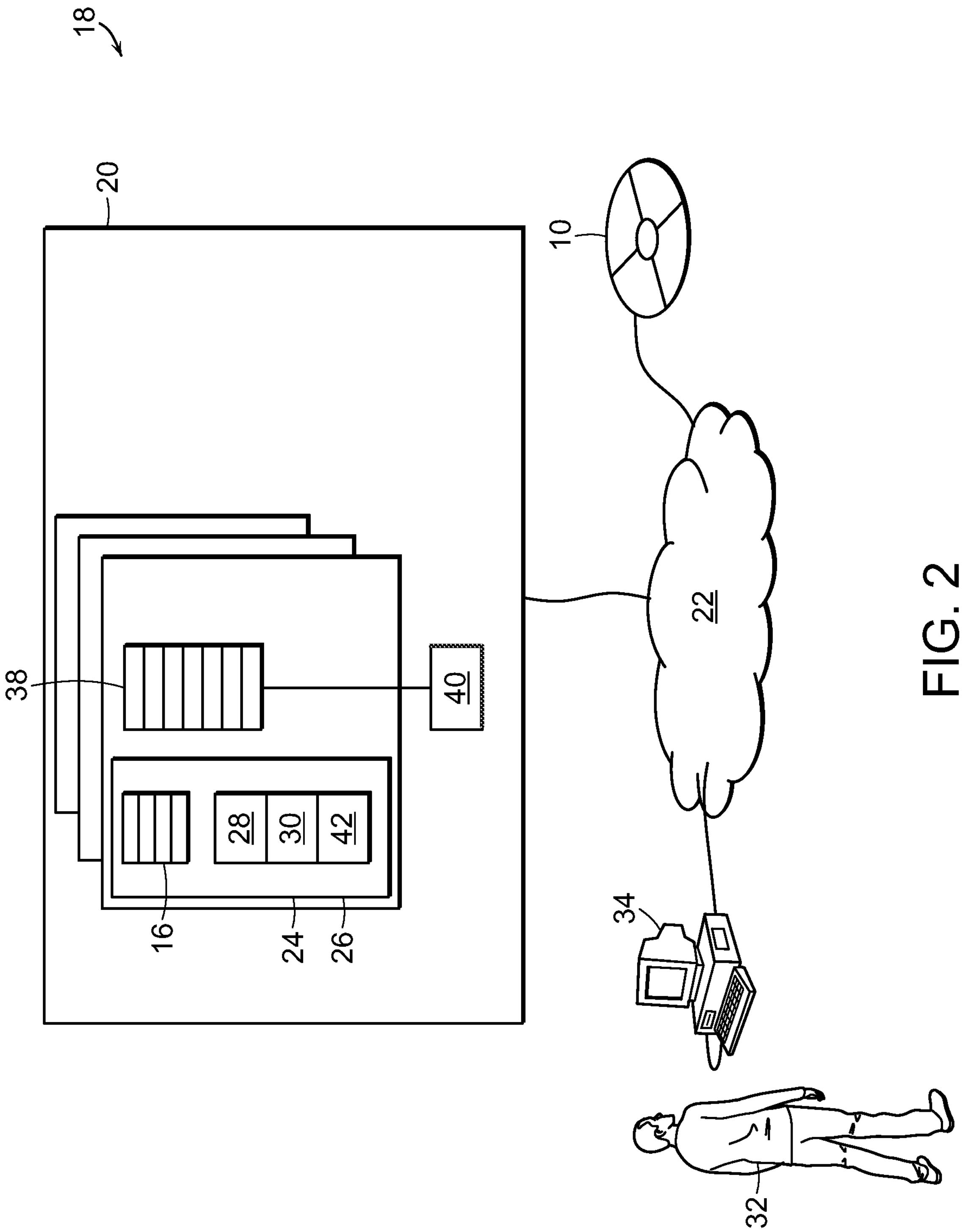


FIG. 2

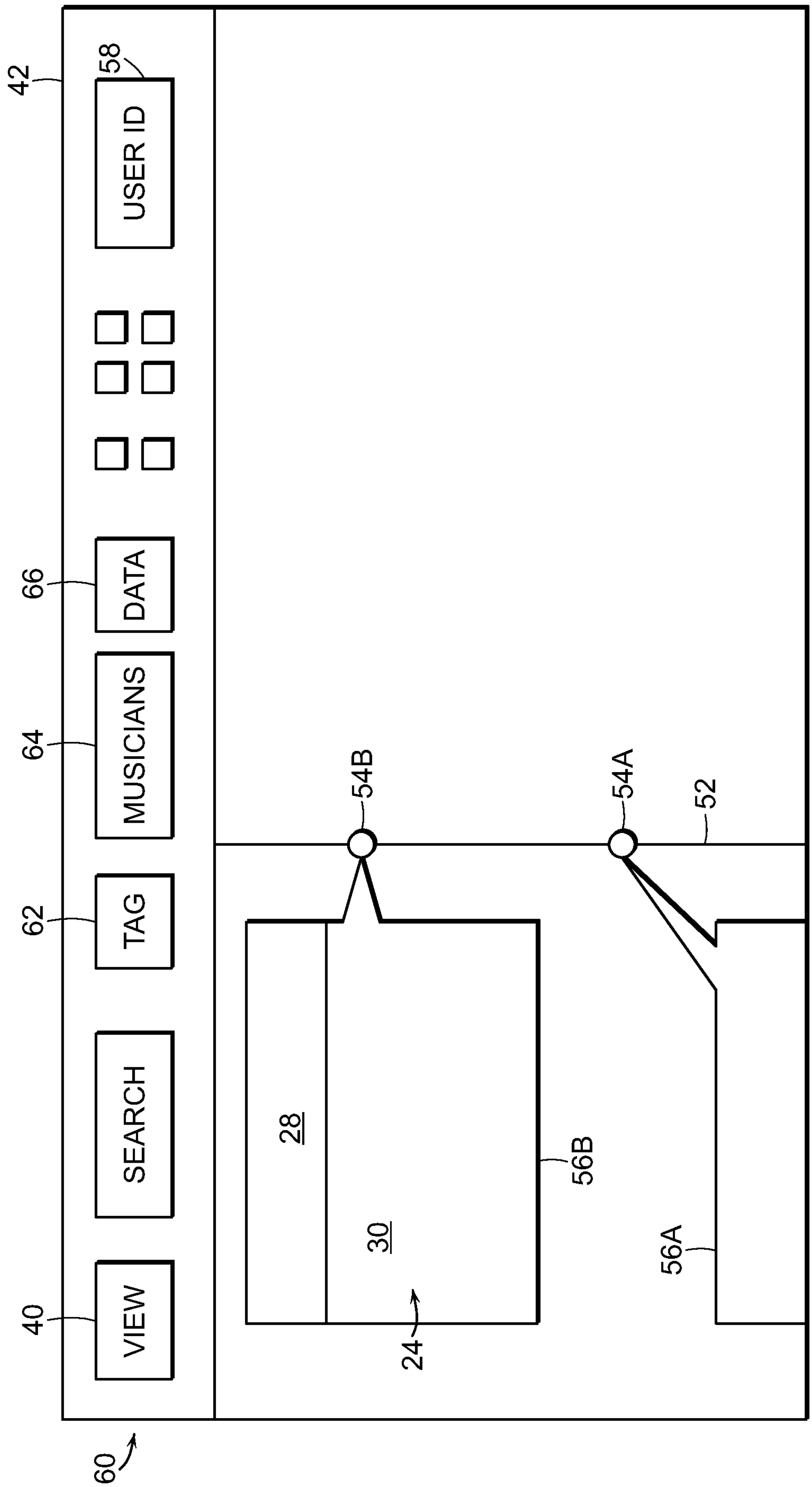

42
58
USER ID
66
DATA
64
MUSICIANS
62
TAG
SEARCH
40
VIEW
60
54B
54A
52
28
30
24
56B
56A

FIG. 3

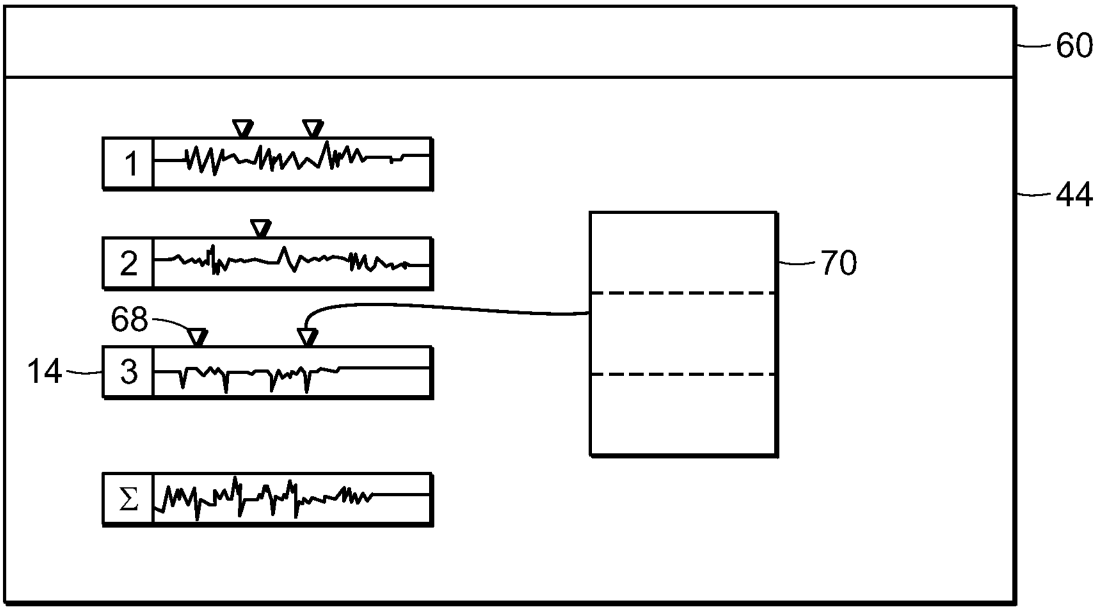

60
44
1
2
3
68
14
Σ
70

FIG. 4

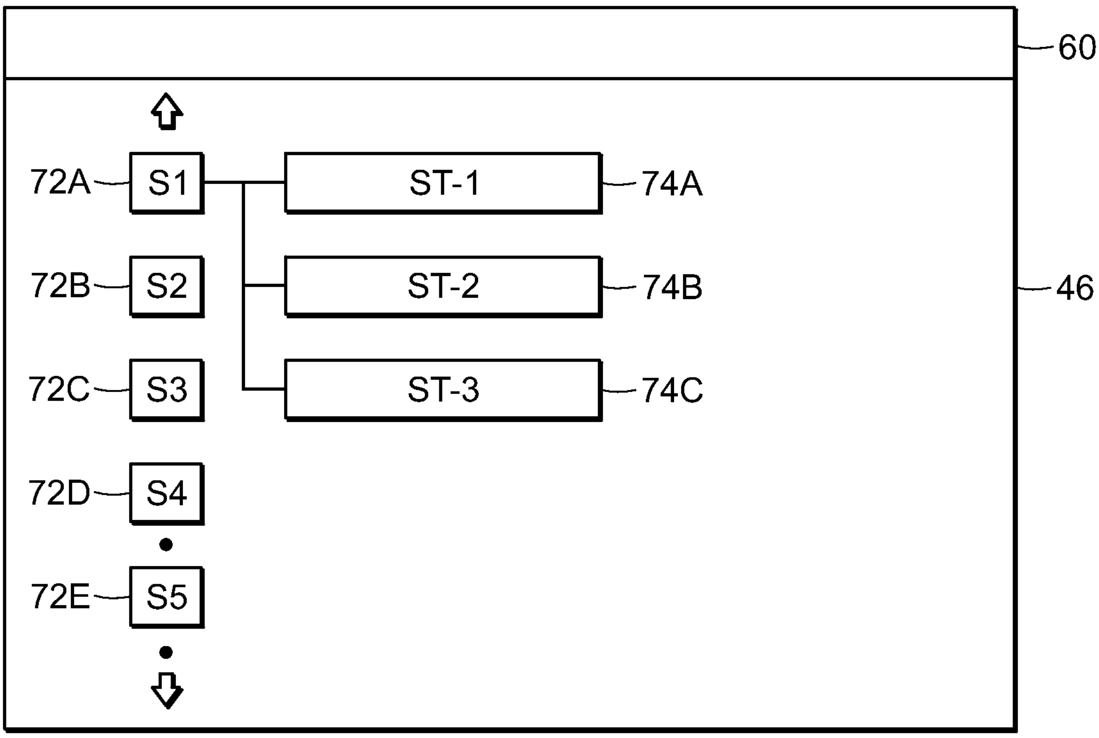

60
46
72A
S1
ST-1
74A
72B
S2
ST-2
74B
72C
S3
ST-3
74C
72D
S4
72E
S5

FIG. 5

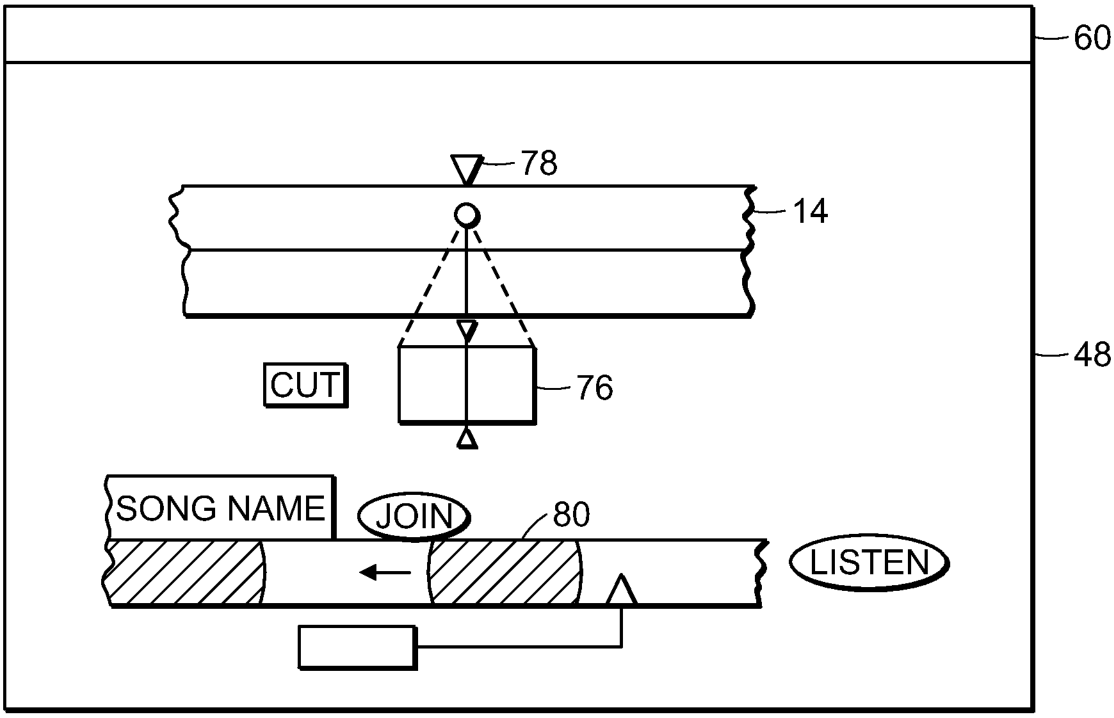

78
14
60
48
CUT
76
SONG NAME
JOIN
80
LISTEN

FIG. 6

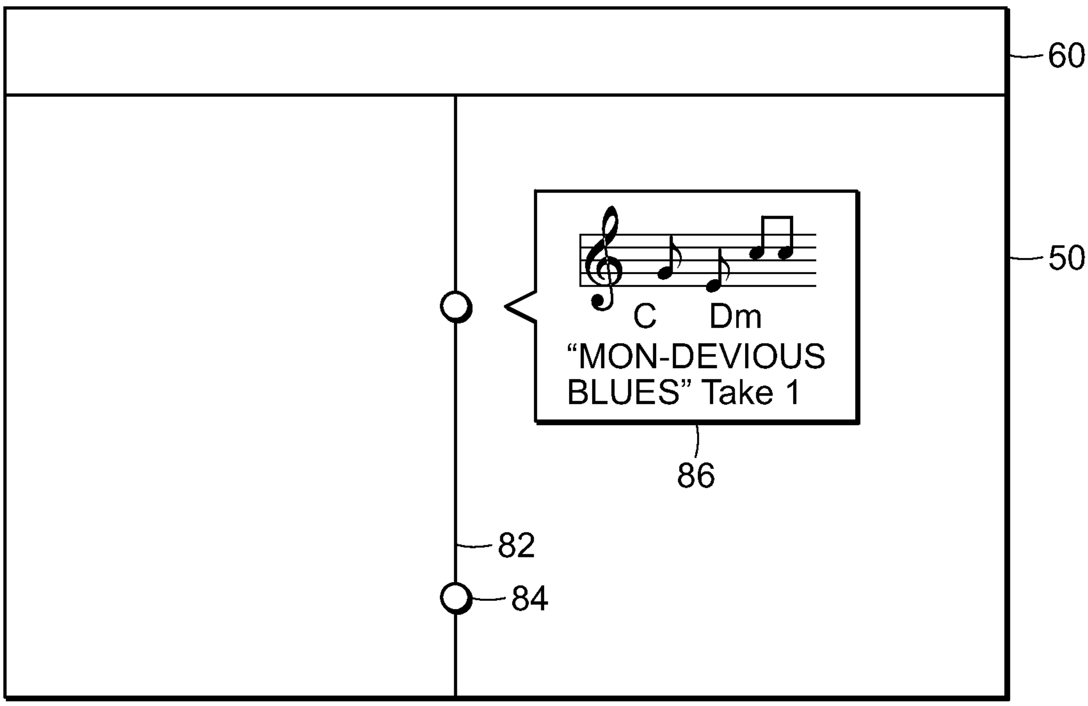

60
50
C Dm
"MON-DEVIOUS
BLUES" Take 1
86
82
84

FIG. 7

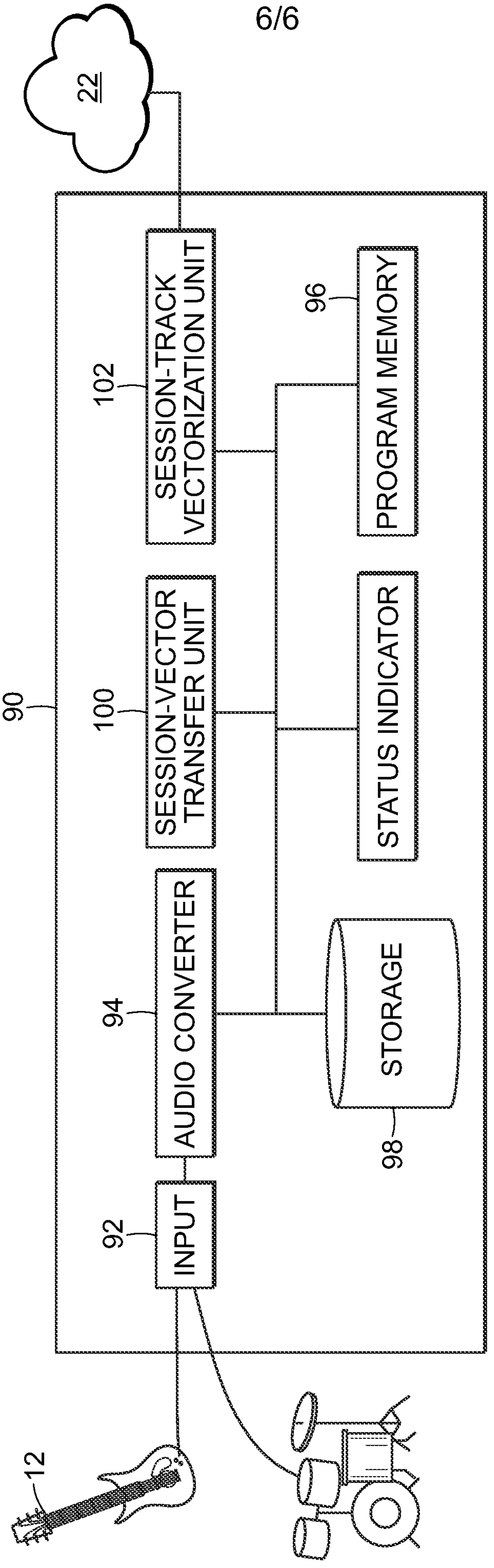
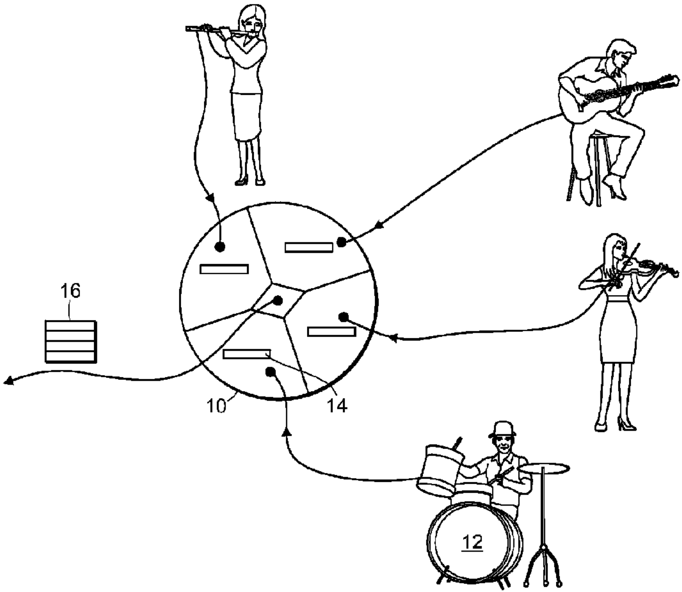

22
90
102
SESSION-TRACK VECTORIZATION UNIT
96
PROGRAM MEMORY
100
SESSION-VECTOR TRANSFER UNIT
STATUS INDICATOR
94
AUDIO CONVERTER
STORAGE
98
92
INPUT
12

FIG. 8


16
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